The Macdonald Journal

JUNE 1981

The Macdonald Journal

JUNE 1981

Volume 42, No. 6
June, 1981

The Macdonald Journal is published by the Extension Program of the Faculty of Agriculture of Macdonald Campus of McGill University.

Second class mail registration number 0463.

Subscription rates are $3.00 for one year, $5.00 for two years, and $7.00 for three years in Canada. Outside Canada — $7.00 for two years.

Printed by Harpell's Cooperative, Gardenvale, Quebec.

In This Issue

Cover: A winter cluster of bees surrounded by some of the common techniques used for wintering bees outdoors in Quebec. Layout by Pierre Langlois.

Journal Jottings

One of the principal objectives of the Journal is to inform the reader of the research efforts being carried out in the various departments at Macdonald. If an answer has been found, we try to tell you what it is; if research continues, we try to say where it is and why and, if the research is just beginning, we would like you to know the reasoning behind its undertaking. Soon after my appointment as Associate Dean, Research, I asked Dr. MacKenzie if he would like to write an editorial for the Journal. He replied, "Yes, I would like to know in what areas the reader thinks we should be concentrating our research efforts." A welcome reversal of roles: we're not telling, we're asking. Bearing in mind the limitations he mentions, I hope there will be feedback to the questions posed by Dr. MacKenzie in his Editorial which can be found on page 2.

Dr. MacKenzie's statement, ". . . unless people use our results, there is no reason for doing the research in the first place" ties in beautifully with our cover story in this issue, which is an example of research being undertaken and the Journal bringing you the results hoping that they will be of assistance. The article on wintering bees is rather lengthy but there did not seem to be a particular section that we felt could be left unsaid. So you can consider this a mini special on bees and on forest renewal. We promised you this article by W.S. Pollock back in November when we published the Woodlands Special Issue, and we would like to take this opportunity to thank Mr. Pollock for his interesting contribution to the Journal.

Hazel M. Clarke

Editorial

We have the answer — but what was the question?

What were 181 graduate students, 87 teaching and research staff, and 2 million research dollars doing at Macdonald in 1980-81? Where did the money come from? The students? What were the results? What do professors do in the summer anyway?

The more you and the agricultural community know about our research efforts, the more useful these efforts are going to be. For several reasons. Firstly, unless people use our results, there is no reason for doing the research in the first place. Secondly, if you are vitally interested in our work, we'll do the very best we can to get the results you need. Thirdly, you may see gaps where more work needs to be done or where new problems are appearing that no one knows about yet. If we are told about these research gaps, we'll be able to tackle them effectively.

But this communication process is complex.

For example, there is a chain of researchers: from the technician through the graduate student to the post doctorate fellow to the research director. Each person in this chain should be aware of the problems, the methods, the possible solutions. In this way each member of the team can be more flexible in approaching the problem and selecting new answers.

Another example. Support for our research efforts comes from the ministries of agriculture of both levels of government, from the National Science and Engineering Research Council (NSERC), from the Québec Ministry of Education, and from industrial contracts. In all cases to get funding for research we have to convince someone in these agencies that we are going to look at important problems, using techniques that promise hope for practical solutions. So another link in the communication scheme occurs: the grantors of research funds must also know of the real problems. This means government and industry people must be made aware of what needs to be done.

But what were the research and contract dollars buying? Many of our projects are fascinating not only because of their subject areas but also, in some cases, because of their seeming lack of direct application and their multisyllabic titles.

Problems like soil tillage, soil compaction with heavy machinery, performance of oats, corn, and forage varieties, orchard pest management, bio-economics of horse and deer flies, potato toxins, saturated hydraulic conductivity of soils, white grub control, freeze drying of foods, pork export potentials, and food marketing costs are a few that are listed on the faculty files.

But to be effective our research must be directed toward real problems facing the agricultural industry. The researcher always faces the choice of "What are the most important problems today that I should tackle with my research dollar? Is what I'm doing really necessary for better food, higher production, less waste, more farm income?" Is water pollution with manure a more important problem than best manure use for crop production? Is soil organic matter maintenance more essential than soil fertilizer improvements? Should we concentrate on prostoglandins in bull semen or diagnosis of reproductive problems in dairy herds — or are these the same problems viewed from different angles?

We need to know the contraints facing the farmer — are they in crop selection, animal productivity, soil management, food storage, or marketing? What questions plague the agricultural industries — marketing inadequacies? food deterioration? new product testing? And governments must be knowledgeable, too — are marketing boards good? plant breeders' rights necessary? land zoning laws useful?

Who do we have at Mac in this chain of research?

We have about 119 M.Sc. students and 62 Ph.D. students scattered through our departments. Research staff number about 90 give or take a post doc or two. Many students are on scholarship in some form of research support from grants received by professors. Thus their efforts are limited to those problems stated in the research plan.

But our students are young, enthusiastic, and what they study today will carry over into their future work in the agricultural industry. So an appropriate choice of research area has a far-reaching and often unrealized future impact — the continuous interest and efforts of professional agricultural workers, whether in research, industry, or government.

How should we solve these communication needs? We want to hear from you about your problems, be they on the farm, in industry, in governments, or even in other countries, and we have to convince the people in the governments and industries as well — or they won't fund our research. We must not be easily discouraged if results are not immediately forthcoming. Researchers have their problems, too. Often funding is limited or unavailable, long-term studies are difficult or impossible because of the short-term nature of research funding. We need time to make up grant applications. But it is a continuous process — so let's keep at it. You have the questions. We have the research tools. By working together the challenges of the 1980s should be easier to meet.

Dr. A.F. MacKenzie
Associate Dean, Research

OUTDOOR WINTERING OF HONEYBEES

by D. Neil Duffy and Professor V. R. Vickery, Department of Entomology

Honeybees do not hibernate during winter. Rather, bees in temperate zones of the world have evolved a remarkable behaviour known as cluster formation to withstand cold temperatures. Even on the coldest day of winter, temperatures above 24°C, and often as high as 35°C, are maintained within the cluster of overwintering bees. The cover depicts a winter cluster surrounded by several of the common techniques used in Quebec for wintering bees outdoors.

The idea of wintering honeybees is not new to Quebec beekeepers. However, recent dramatic increases in the cost of package bees have stimulated even more interest among beekeepers in wintering their bees. Also the short period of time available for colony buildup between package installation and the main honey flow prevents the maximum buildup by package bees necessary for maximum honey production. The question is how can beekeepers winter their bees in an economical method that ensures colony strength and survival.

This article will present a review of the mechanisms of the winter cluster, the essentials for successful wintering of bees, and a variety of techniques for outdoor wintering. Outdoor wintering is practical for anyone keeping bees, from the hobbyist with one colony to the full-time beekeeper with hundreds of colonies.

The winter cluster

Insects are dependent upon the temperature of their surroundings for their own body temperature. Roeller (1977) has shown that individual honeybees can function at temperatures as low as 6.1°C (43°F), but at lower temperatures a bee loses the ability to move. The bee colony faced with the problem of enduring cold winter temperatures has evolved what is known as cluster formation.

In the fall brood rearing is considerably restricted, and ceases in September or October. During the cold nights the bees begin to form a loose cluster to conserve heat. Clustering begins when the lowest temperature among the bees approaches 14°C (Braun and Geiger, 1955). As outside temperatures continue to fall the cluster contracts until at 6-8°C all of the bees are involved and an insulating shell of bees one to three inches in thickness is formed. Bees crowd into empty cells and into the spaces between combs to form this insulating layer. In the centre of this shell there is a lower density of more active bees. These bees consume honey and by moving their bodies back and forth or fanning their wings they generate heat. Bees in the insulating shell are much less active and may appear to be dormant. In fact, these bees do very slowly rotate positions so that any one bee does not spend too long at the periphery. Also, bees in the warmer portion of the cluster pass honey to those on the outside.

At the beginning of winter the cluster usually forms over the lower portion of the accumulated honey and pollen stores in the frames (Greve 1973). As winter progresses the bees tend to move upward. The cluster is usually ellipsoidal in shape (Owens 1971) but is capable of considerable movement, especially when outside temperatures rise.

Corkins (1932) was the first to recognize that within certain limits the cluster temperatures remain constant regardless of external temperatures. A number of other researchers have since studied the temperature profile of clusters, and we can now characterize a cluster using isotherms. Farrar (1944) found that sufficient heat is produced in the centre of the cluster to maintain a temperature above 7°C at the outside edge of the cluster. The bees make no attempt to heat the unoccupied portion of the hive, and the temperature several inches from the cluster may fall considerably below 0°C. Owens (1971) used a large number of thermocouples in hives to obtain a three-dimensional profile of the winter cluster. He found the 6.7°C (44°F) isotherm defined the outside limit of the cluster. Furthermore, the insulating layer of bees was densest in the temperature zone from 12.8-13.3°C, and the heat generating centre was within the 24.4°C isotherm. During broodless periods (mid-October to late January) maximum temperatures in the cluster's centre fluctuate between 26°C and 34.5°C. However, in early February, as day length increases and warm spells frequently occur, the temperature in the centre of the cluster is raised and held between 33.9 and 34.5°C. When the temperature reaches 33.9°C, egg-laying commences and, if pollen is available within the cluster, brood rearing will result.

The cluster size changes in response to changes in external temperatures, and in winter outside temperatures can fluctuate widely. Metabolic heat produced in the centre of the cluster is sufficient to equal the heat radiating from the surface of the cluster at about 7°C (Farrar 1952). As outside temperatures decrease below 7°C, the cluster contracts reducing the surface area from which heat is lost and the bees in the centre of the cluster become more active to generate heat. When outside temperatures rise above 7°C, the cluster expands. Thus a balance between the size of the cluster, the thickness of the insulating layer, and the heat generated in the centre of the cluster is maintained. Studies have shown that bees use their honey reserves most efficiently at

7°C and therefore consume less than might be expected (Betts 1943). A cluster of bees can withstand prolonged periods of very cold temperatures as long as honey is available. In one experiment an unprotected colony was placed in a refrigerated room held at an average temperature of –24.2°C for 84 days (Owens, 1971). These bees were able to maintain a minimum temperature of 27°C within the cluster throughout the experiment. Colonies do perish during the winter and one reason for this can be cold starvation (Greve, 1973). The cluster can more vertically or horizontally on the combs without much difficulty, though such movement is very slow. However, a prolonged period of cold weather can prevent bees from moving from comb to comb. Cold starvation can occur even with plenty of honey in the hive but in combs the bees cannot reach. A single warm day often allows bees to obtain honey from which they have been isolated.

The Essentials of Winter Bees

Success in wintering bees depends on the following essentials:

1. Strong and disease-free colonies with mostly young bees and a productive queen in the fall;
2. Sufficient and properly positioned stores of honey and pollen;
3. Wrapping that provides wind protection but allows for adequate ventilation.

The selection of colonies to be overwintered should be carried out in August. Weak colonies can be united with colonies needing a boost in strength by placing a weak colony on top of the other colony and separating them with a single sheet of newspaper. Weak colonies can also be killed after the end of the fall honey flow using Cyanogas® , and the honey crop taken off. It is far more advantageous to the beekeeper to take colony losses in the fall rather than try to overwinter understrength colonies which usually fail to survive. A very small cluster will cover only a very small portion of its stored honey, and a spell of cold weather usually means starvation. An adequate number of bees in the fall is 25,000 - 30,000 bees (6-8 lbs.). Just as important is that most of these bees be young bees, reared after August 15. Summer bees raised before this date have only six-week life spans, and these bees all die off before midwinter. Fall bees differ physiologically, and can survive until early spring. Therefore the size of the wintering cluster is determined by the amount of fall brood production which depends largely on queen performance so maintaining a young vigorous queen is important to winter success. Queen loss or failure during the winter will cause loss of a colony. Egg laying begins in late January to early February in wintering colonies, and without this production colonies dwindle and die. Old queens fail more frequently, so good management implies requeening at least every other year.

An excellent time to inspect colonies for brood diseases is after the removal of the honey crop and, if a Foulbrood Disease is detected, a beekeeper should call in a provincial inspector. Colonies with undetected American Foulbrood (AFB) frequently die in spring due to inability to build up, and robbing of these colonies usually spreads the disease. *Nosema* is an intestinal protozoan which affects adult bees and occurs in most colonies. However, levels of *Nosema* intensify during the winter months, and severe infections can cause spring dwindling, queen loss, and colony loss. Effective control of this parasite can be achieved by incorporating a rounded teaspoonful of fumagillin (Fumidil-B®) per gallon of sugar syrup fed to the bees in fall and spring. Antibiotics fed at these times are consumed by the bees and do not contaminate the honey crop.

It is essential that colonies are provided with an adequate supply of honey and pollen stores that are within easy access of the wintering cluster. Forty pounds of honey is considered the minimum amount needed for wintering bees in a single brood chamber in Nova Scotia (Karmo 1958). In Quebec, however, colonies are more often wintered outdoors in a double brood chamber, and 70 pounds is considered an adequate reserve of honey. These two-storey colonies, with their food supply, should have a gross weight exceeding 110 pounds. Immediately after removal of the honey crop sucrose sugar syrup should be fed to the bees. This syrup should be concentrated and, ideally, is made up of two parts sugar to one part water by weight. It is important that this feeding be completed by mid-October to leave the bees enough time to invert the sugars and store the syrup. This syrup can be fed to the bees by a variety of equipment including: Miller tray-feeders (see Figure 1), feeder pails inverted over the frames, or internal division board feeders.

Figure 1.

The reasons for supplying sucrose syrup are twofold. Some honeys, particularly fall aster honey, tend to granulate quickly in the combs. The only way granulated honey can be utilized by the bees is for them to forage for water which is an unlikely prospect in the winter. This problem is avoided by feeding sugar syrup which provides a food which remains liquid throughout the winter. Secondly, the fall honey flow in Quebec is quite variable. Feeding syrup in the fall ensures a proper distribution of food reserves. As brood rearing tapers off in September and October a considerable amount of comb space,

especially in the upper brood chamber, becomes available. Feeding syrup results in filling most of this space with an ideal food reserve. The winter cluster mainly occupies the brood rearing area of the brood chamber and also shows an upward movement as winter progresses. Thus feeding increases the amount of food directly available to the cluster and lessens the chances of starvation. Karmo (1975) found that food consumption during the broodless period was as low as one to three pounds per month. With the onset of brood rearing in February, food consumption increases rapidly and may exceed one-half pound per day in April.

Bees also require a stored supply of pollen to winter successfully. In regions where aster is abundant in the fall, the bees may be able to gather enough pollen to fill at least three combs (500 square inches) which are recommended as a reserve. Bad weather or a shortage of pollen sources may necessitate the fall feeding of pollen or pollen supplement or substitute (Figure 2).

gure 2.

pring brood rearing begins long efore new pollen becomes vailable. Nurse bees must con- ume pollen before their ypopharyngeal glands can begin to ecrete the protein-rich royal jelly ecessary for brood feeding. In uebec poor spring buildup is often aused by an interruption in brood earing after stored pollen is ex- austed. This problem sometimes oes unnoticed, as brood rearing as often restarted as early pollen ources become available to the ees before the colonies are un- acked. Farrar (1936) studied this oblem and concluded that the umber of bees in a colony in spring hen new pollen became available as nearly proportional to the amount of reserve pollen provided in the fall.

It has been repeatedly shown that colonies can be wintered without wrapping or packing in Quebec if the essentials of colony strength and stores are met. However, without too much effort colonies can be protected against the effects of wind and moisture and, undoubtedly, winter much better.

Selecting a sunny, dry, and wind-protected site improves wintering. A sunny exposure is beneficial as the sun's warmth can raise the hive temperature well above outside temperatures. This has the following benefits: it allows the bees to defecate outside of the hive during cleansing flights, it results in an earlier start to spring brood rearing, and it allows the bees to reposition themselves in relation to their honey stores. A dry wintering site is also important for several reasons. Dampness in the hive causes increased incidence of *Nosema,* excessive heat loss, the possibility of fermentation of honey stores, and moulding of the pollen.

The Moisture Problem

More colonies are lost each year due to moisture problems than due to cold temperatures. Schutte (1977) emphasizes this problem by pointing out that a gallon (4.55 litres) of water vapour is generated for every 10 pounds (4.5 kg) of honey consumed by the bees. If this moisture does not escape from the hive, it can condense on the combs, inner cover, or even on the cluster of bees. When this water freezes on the bees, they are killed. Accumulated ice on the inner cover and comb can melt during a thaw, and the water dripping on the bees causes considerable stress. The solution to the problem of moisture buildup rests with adequate ventilation. An upper entrance is very important. Our preferred technique is to cut a two-to three-inch notch in the 5/16 inch raised rim of our homemade inner covers. During summer the notch is in the top side, but in fall the cover is flipped over to provide a top entrance. This allows bees to fly on sunny days during the winter and also excess moisture to escape. Our covers also have a large double screened area in their centre (approximately one-quarter to one half of the total area) which significantly improves ventilation. Ventilation is also important in removing carbon dioxide produced by the respiration of the bees (Bland, 1977). A less satisfactory technique involves drilling a 3/4'' to 1-inch hole with an auger through the front of the upper brood chamber.

Insulation

Whether or not to insulate wintering colonies has been the source of much debate. Early in this century beekeepers favoured packing and insulating their colonies as much as possible. Research has since shown that over-protection does not benefit the colony and increases moisture problems. Studies by a number of researchers have shown the benefits of moderate insulation (Farrar 1944, 1952: Braun and Geiger 1955; Owens 1971). Hive insulation has little effect on the cluster under constant conditions, as the bees make no attempt to heat the entire hive. However, when a sudden drop in the outside temperature occurs, hive insulation allows the cluster to contract more gradually and better organize its position in relation to the stores. Fewer bees are left stranded as the cluster contracts. Insulation has been shown to slightly decrease food consumption.

Too much packing prevents colonies from responding to warm external temperatures, i.e., to shift their position on their stores and take cleansing flights. It may also delay early brood rearing. At Macdonald we have used two-inch styrofoam insulation on the top of colonies with good results for a number of years. Side insulation, such as will be described in a multiple colony packing method, has been used successfully for a number of years in western Canada (Braun and Geiger 1955: Bland 1977; Peer 1978).

Packing Techniques

There are a variety of techniques for packing bees for winter. Generally those techniques which require more labour tend to provide more

protection for the colony. The beekeeper must decide which technique to employ after considering the number of colonies and the time available. Part of our research effort at Macdonald involves the comparison of various techniques to establish which is most efficient for Quebec winters.

a) **Single colony wintering case.** The simplest and quickest method used for packing bees in Quebec is the single colony cardboard wintering case. The case consists of a double fluted corrugated cardboard sleeve. The sleeve is stapled on one seam, painted black exteriorly, waxed for waterproofing at the bottom edge, and has four upper flaps. This sleeve fits tightly over a two-super standard 10-frame hive. Insulation (we prefer styrofoam) can be placed on the inner cover, and the four top flaps are folded down over the insulation. The outer cover can be placed on top of the flaps and weighted down with rocks. A hole must be cut in the case at the upper entrance, and it is best to nail wood cleats above and below the opening to hold the cardboard tight (cover photo, lower left). This simple technique can produce surprisingly good results in Quebec in comparison to other techniques which

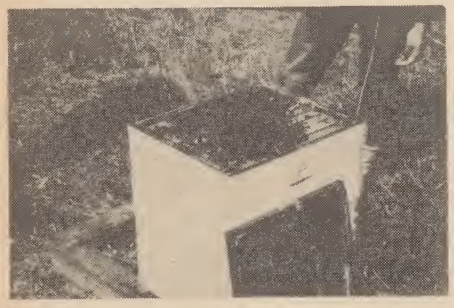


Figure 3.

provide more protection. Figure 3 demonstrates the strength of a colony on April 1 which was wintered by this technique. With proper treatment and storage, these reasonably priced cases can be used repeatedly.

b) **Packing colonies in rows.** A labour-saving method used by some commercial outfits involves packing large numbers of colonies in a row. Colonies are placed tightly together side-by-side. Building paper is then secured at one corner with a wood strip, wrapped around the entire row, and held tight with wood strips or staples. Insulation can be placed on top of the colonies and the building paper is folded down over it. A length of building paper is then placed over the top and folded over the sides to weatherproof the top of the colonies (cover photo, lower right). The outer covers can be placed on top and held down with bricks or rocks. An upper entrance must be provided for each hive as snow normally blocks the lower entrance. In the cover photograph, upper entrances with wind deflectors as designed by Vickery (1977) are visible. The hive opening is covered, and bees can move about in the "porch" before exiting at either end. This simple device prevents wind from blowing directly onto the cluster, and is useful for any outdoor wintering technique. The large number of bees on the snow around these hives is not a cause for concern. It has been shown that the oldest bees respond sooner to the need to defecate and take earlier cleansing flights. Some of these bees are unable to make their way back to the hive, but these bees are soon replaced by emerging brood in healthy queen-right colonies. The advantages of this method are the relative ease with which large numbers of colonies can be packed and the protection afforded by having the colonies placed together.

c) **Packing colonies in blocks.** Several techniques have been developed to increase the heat economy of wintering colonies by packing them in blocks of four or more colonies. These methods require a greater labour input, but generally have resulted in excellent spring buildup. Two different methods of packing colonies in blocks will be described.

i) **Western four colony pack.** This method is a combination of those used by Bland (1977) and Peer (1978) in the prairie provinces. In October colonies are placed in blocks of four with entrances facing east and west. The colonies are wrapped with two-inch fibreglass rolled insulation held in place by tacks or twine. The insulation vapour barrier is on the outside. Four inches of insulation are placed above the inner cover, and the colonies are wrapped with building paper. The paper is folded over and a 44 inch square of 5/16 inch plywood is placed on top to keep moisture out of the hive. Baler twine is tied snugly around the sides and over the top of the pack to secure the top and bend the plywood into a slightly rounded position. The top entrances are cut out and a piece of plywood with a 4 x 3/4-inch slot is nailed tightly over each of the entrances.

The upper left cover photo shows a modification of this method which was tried at Macdonald for the first time during the winter of 1980-81. This pack is as described except that a telescoping plywood winter cover containing four inches of insulation has been substituted for the plywood cover. This technique was very successful and produced the strongest colonies of all four techniques tried in 1980-81. Figure 4 shows colony strength on April 1 of a colony packed by this method. All

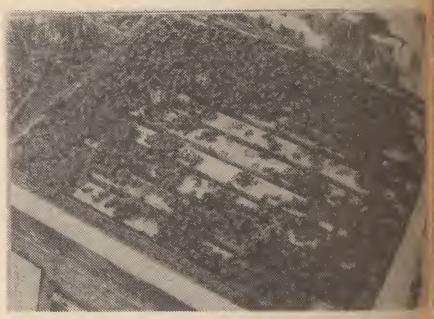


Figure 4.

four colonies were very strong and were split into double-queen colonies. An improvement on this technique would be to use wind deflectors over the entrances, as ice buildup in the entrances was a problem.

ii) **Multiple colony blocks.** This technique was developed in Nova Scotia by Karmo (1958, 1975) and has been successfully adapted to Quebec conditions by Vickery (1977). Figure 5 is a sequence showing four colonies being packed by this method. They are placed tightly together on an insulated base (40" x 33-1/4") constructed of 1x4-inch lumber covered top and bottom by 1/2" plywood. These colonies must have short bottom boards (16-1/2" x 20") to permit a tight wrapping. Normally we place a second tier of four colonies directly on the screened inner covers of the lower tier. In Nova Scotia as many

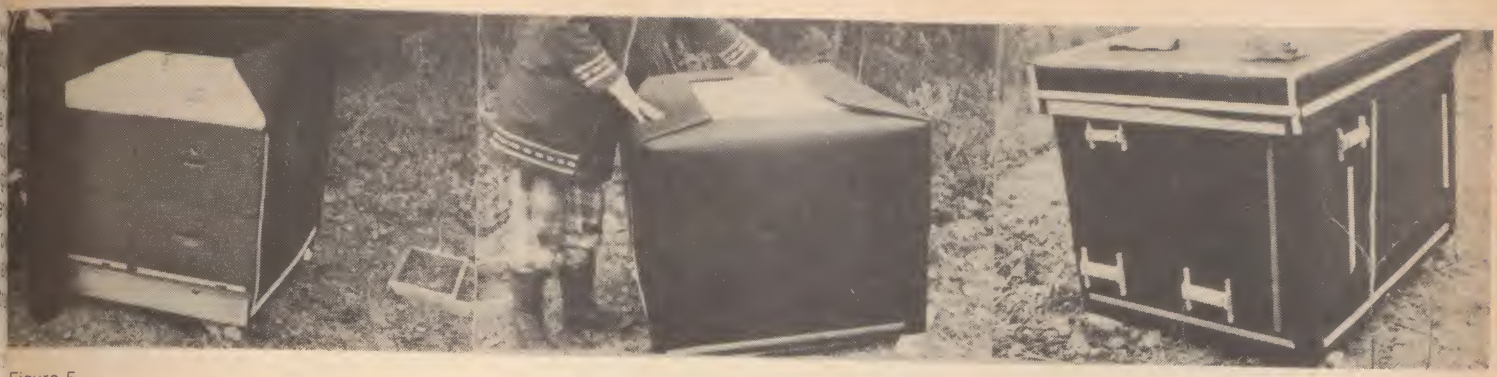


Figure 5.

as 20 single brood chamber colonies have been wintered in a single block. For Quebec conditions, however, we recommend that the lower tier be kept in double brood chambers, and upper colonies may be in single or double brood chambers. Insulation is placed on top of the upper tier, and the entire block wrapped with black building paper secured by wood strips. A telescoping cover with 4 inches of insulation and a polyethylene vapour barrier fits over the top (cover photo, upper right). Upper and lower entrances must be located through the building paper, the paper cut out, and wind deflectors nailed on to provide wind protection and hold the paper tight.

This technique offers excellent protection to each colony. As well, upper colonies are heated from the colonies below and these colonies show remarkable levels of spring brood rearing. Under normal conditions these colonies are always suitable for splitting or double-queen management. Another advantage of this method is that the upper colonies in a block normally keep their bottom boards free of dead bees. Although this technique requires construction of bases and tops and packing is more time consuming, the results over a number of years using this method have been very good.

Research at Macdonald

Based on the research of Corkins (1932), Farrar (1944), Owens (1971), Gurgalla (1975) and others, the winter cluster can be characterized from temperature readings. Throughout the past two winters we have monitored temperatures within colonies of bees packed for winter by different techniques. We have

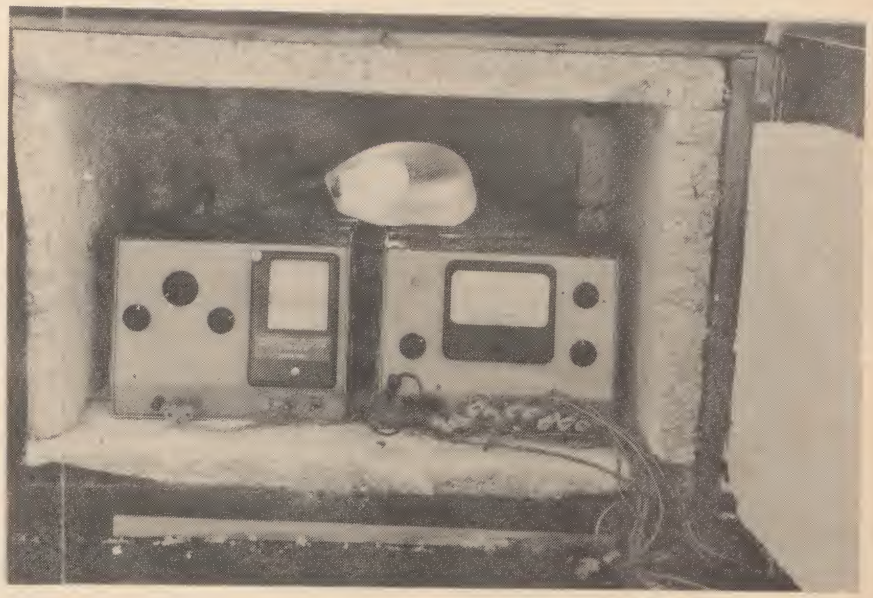


Figure 6.

tested individual cardboard wintering cases, the western insulated four colony pack, and the multiple colony pack. With our data we are able to compare the clustering behaviour of the bees within colonies packed by these different techniques under different weather conditions. Other important parameters in our study have included colony survival, food consumption, and spring build-up.

Results

Temperature data. Eleven thermistor probes were placed in colonies in the fall. These probes were connected to an automatic scanning telethermometer which measures the temperature at the location of each probe for one minute before switching to the next probe (Figure 6). The telethermometer was connected to a chart recorder and a continuous record of temperatures within the hives was obtained. In 1979-80 one probe was placed in each of 11 colonies including eight colonies in a multiple block and three individually packed colonies.

This winter two or three probes were placed in one colony packed by each of the following techniques: upper and lower colonies in a multiple block, the western insulated four colony pack, and individually packed colonies in cardboard wintering cases.

Temperature readings from within the colonies were considered in three categories depending on the location of the probe with respect to the cluster. Probes were either in a) the heat generating centre, b) the dense insulating layer of the cluster, or c) outside the cluster.

Comparisons were made of the temperature fluctuations within each of these categories for the different wintering techniques.

a) There was no significant variation in the temperatures in the heat generating centre of the clusters in colonies packed by the different methods. In fact, changes in outside temperatures had no effect on the centre of the cluster.

b) Significant differences were evident in the fluctuations in temperatures in the insulating layer of bees in colonies packed by the different methods. These readings indicate the expansion and contraction of the cluster. In particular, the cluster of upper block colonies changed in size much less than lower block colonies. The clusters of lower block colonies changed greatly in size as external temperatures changed. It was already known that the clusters of upper block colonies are more expanded. This is certainly due to the heat input received from colonies below them in the block. In our study, the cluster of these upper colonies did not change appreciably in size, even when the outside temperature changed as much as 12°C in a 24-hour period. These colonies benefit as their expanded clusters cover a larger portion of their food reserves. Lower block colonies, however, are adversely affected by the great fluctuations in their cluster size. Rapid contraction of a cluster does not allow the bees time to arrange the cluster efficiently, and groups of bees are left behind as the cluster retreats.

c) No differences were observed in temperatures recorded just outside the limits of the cluster. This is to be expected as the cluster size is regulated so that 6.7°C is maintained at the outer edge of the cluster.

Food consumption was estimated by weighing colonies in fall (October 15) and spring (April 1). In 1979-80 the upper block colonies used more of their honey stores (20.9 kg), followed by lower block colonies (15.2 kg), and individually packed colonies (10.7 kg). This is a reversal of what has often been suggested since the "better protected" colonies actually consumed more. This can be rationalized though since block colonies, and especially the upper colonies, maintain larger clusters. These bees then have access to more of their honey stores. Another factor based on years of observations is that block colonies (and again especially upper colonies) raise larger amounts of brood in March. This increased brood rearing is beneficial as these colonies can normally be divided after mid-April.

Colony survival and strength. The bottom line of our studies comparing different wintering methods is what is the condition of the colonies in the spring. As if to demonstrate the complexities of wintering bees, we have experienced different results in the past two winters.

In 1979-80 colonies wintered very well by all methods. Colonies in the multiple colony block were slightly stronger than individually packed colonies, but the difference was less than expected.

During the 1980-81 winter, temperatures were unseasonably warm in February. This stimulated greater than usual brood rearing, especially in the upper multiple block colonies. These colonies completely used up their centre comb stores feeding this brood. Then temperatures in March became unseasonably cold causing clusters in all colonies to shrink. Two of the upper block colonies starved as no honey was left available to the cluster when it contracted. The outer combs of these colonies held considerable honey and large amounts of brood were present, but these colonies perished due to cold starvation. The lesson here is that block colonies are normally very strong in the spring and special attention should be paid to their fall feeding. These colonies use more stores to feed the large amount of brood, and unseasonable weather can cause problems. This winter the western insulated four-colony pack was tried for the first time. The heavy insulation around these colonies protected them against the temperature extremes and these colonies were exceptionally strong in the spring. These colonies reared less brood in March and consumed less of their stores.

It is apparent that there are many questions still to be answered about wintering honeybees outdoors. Our hope is to continue and expand our research towards developing the most efficient technique.

Acknowledgements

The authors wish to thank Pierre Langlois of the Department of Entomology for his efforts in preparing the cover and photographs for this article. Ron Yacowar helped initiate this project in completing his final year undergraduate project.

Bibliography

Betts, A.D. 1943. Temperature and food consumption of wintering bees. Bee World 24(8): 60-62.

Bland, E. 1977. Wintering honeybees in Saskatchewan. Gleanings in Bee Culture 105(11): 485-487, 514.

Braun, E. and J.E. Geiger. 1955. Comparison of methods for wintering honeybees in the Prairie Provinces. Can. Dept. Agr. Publ. 689: 3-8.

Corkins, C.L. 1932. The temperature relationships of the honeybee cluster under controlled external temperature conditions. J. econ. Ent. 25: 820-825.

Farrar, C.L. 1936. Influence of pollen reserves on the surviving populations of over-wintered colonies. Am. Bee J. 76(9): 452-454.

Farrar, C.L. 1944. Productive management of honeybee colonies in the northern states. U.S.D.A. Circ. No. 702: 1-28.

Farrar, C.L. 1952. Ecological studies on overwintered honeybee colonies. J. econ. Ent. 45(3): 445-449.

Furgala, B.1975. Fall management and the wintering of productive colonies. Pages 471-490 *in* Dadant and Sons, eds. The hive and the honey bee. Dadant and Sons, Hamilton, Ill.

Greve, C. 1973. Preparing bees for the winter. Gleanings in Bee Culture 101(12): 379-380.

Karmo, E.A. 1958. The wintering of bee colonies in Nova Scotia. Nova Scotia Dept Agr. and Marketing Circ. No. 82: 3 pp.

Karmo, E.A. 1975. Beekeeping in Nova Scotia. Apiary Management. Nova Scotia Dept. Agr. and Marketing Publ. 37-41.

Moeller, F.E. 1977. Overwintering of bee colonies. U.S.D.A. Ag. Res. 169: 1-15.

Owens, C.D. 1971. The thermology of wintering honeybee colonies. U.S.D.A. A.R.S. tech. Bull. 1429: 1-32.

Peer, D.F. 1978. A warm method of wintering honeybee colonies outdoors in cold regions. Can. Beekeeping 7(3): 33, 36.

Schutte, H. 1977. The importance of winter ventilation. Gleanings in Bee Culture 105: 484, 513.

Vickery, V.R. 1977. A successful method for wintering honeybees. Can. Beekeeeping 6(9): 116-117.

The Problem of Forest Renewal on Private Woodlands

by W. S. Pollock[1], BSc.F., F. ENG., Consulting Forester

Clearcutting on private woodlots is usually followed by regeneration which often consists of species of lower value than those which were cut. A problem of degrading results. This has resulted in a tendency to clearcut and plant in an effort to maintain quality.

However, the costs of planting operations are high — $200 to $500 per acre — and the returns will not often justify this investment. Government subsidies are available to encourage planting, but this does not seem logical when harvesting methods other than clearcutting can encourage desirable natural regeneration. The higher costs of harvesting are more than balanced by the savings in establishing the next crop. It is our contention that we should be managing our forest stands in such a way that conditions are favourable to natural regeneration of the "most desirable" species found in sufficient abundance in the stand.

For the optimum chance that the method will work, there must be a certain number of trees of "desirable species" left in the stand as a seed source. This implies some form of partial cutting at intervals. Cutting should be done during years that the trees of "desirable species" are producing seed. Many species of trees only produce seed every two to five years. And, finally, the ground and shade conditions of the seedbed must be favourable for seed germination and seedling development. There is no guarantee that the method will work, but if it does, considerable savings will result. If it doesn't, site preparation and reforestation are still options.

"Desirable Species"

What is a "desirable species"? This is a rather complex question because it depends so much on the site and location that you are talking about. In a tolerant hardwood stand, yellow birch, white ash, red oak, and other high value species should be considered "desirable species". White pine, spruce, and yellow birch might be considered desirable in mixedwood stands while spruce may be the most valuable species in a softwood stand.

The following is offered as a **suggested list** of species in order of decreasing desirability based on **good quality stems.** Changing market conditions could cause changes in this list and it should be revised accordingly. Low quality trees have about the same desirability, regardless of species, but large differences in value exist between species when **physical quality is high.** Site will also play a role in defining what is a "desirable species".

Softwood and Mixedwood Stands: Red spruce, White pine, Yellow birch, Black spruce, White spruce.

Tolerant Hardwood Stands: White ash, Yellow birch, Red oak, Sugar maple, Black cherry.

Intolerant Hardwood Stands: White ash, Sugar maple, White birch, Yellow birch, Red oak, Basswood.

"Desirable Stands for Natural Regeneration"

In all natural regeneration, there has to be a source of seed which should come from the most "desirable species" in the stand. Some stands may have very few of the most desirable species. Some may have many of more than one "desirable species".

There should be a certain number, of trees of "desirable species" in a stand in order to have a "desirable stand for regeneration". In other words we are suggesting a minimum seed source standard. This standard may be in young trees not yet producing seed (future seed source) or in mature trees (present seed source). Under proper management the young trees will eventually produce seed and will regenerate the stand. The fact is that if we have a minimum number of trees of "desirable species" regardless of their size or age, and, if we look after them and don't destroy them in logging operations, they will eventually produce seed and can regenerate the stand with more "desirable species" — and we won't be degrading the stand. At least we will be doing the **best** we can as far as natural regeneration is concerned.

Our suggested definition of a "desirable stand for natural regeneration" would be at least two acres in area. It should also be

Bill Pollock is President of Timmerlinn Limited and has provided forestry consulting and management services to private woodlot owners throughout eastern Canada for over 20 years. He has recently completed a book for private woodlot owners in Nova Scotia entitled, "The Trees Around Us — A Manual of Good Forest Practice for Nova Scotia" excerpts from which were used in this article. Although the Manual is written for Nova Scotia's forest conditions, much information in it will be of use to woodlot owners throughout eastern North America. The book is available from the Nova Scotia Government Bookstore, P.O. Box 637, Halifax, N.S. B3J 2T3 for $8 including postage and handling.

capable of producing about one half cord per acre per year of wood fibre. This latter condition puts the stand in a Class 3 land capability for forestry rating or better of the Canada Land Inventory. This will exclude poorly drained swampy sites and rocky hilltops which should probably be managed for wildlife instead of wood production.

Finally, the suggested minimum standards for a satisfactory "future seed source" are: a minimum of between five and 50 well distributed living trees of any one "desirable species" per acre one foot or more in height above the ground depending on their size. If they are between one foot and 10 feet in height, then at least 50 will be required. If they are all over eight inches in diameter, then about 10 will suffice. The bigger the trees the fewer required. Thus the stand will qualify as a "desirable stand for regeneration."

Harvesting operations or the silvicultural treatment should aim at regenerating the most valuable species which meets the criteria outlined above.

If a stand does not have enough trees of any one "desirable species" to qualify as a "desirable stand for regeneration" then it can be clearcut followed by planting with "desirable species." If it does have the required number of trees of "desirable species" then it should be silviculturally managed or harvested by the best known means to promote the natural regeneration of the "desirable species". If, by doing this, you do increase the number of "desirable species", you will have improved your forest.

"Satisfactory Regeneration"

In the preceding section, we established a minimum standard by which a stand would be capable of regenerating itself naturally under **good forest practices** with "desirable species" to create another "desirable stand for natural regeneration". We did not define what amount of regeneration we wanted from the "desirable stand for natural regeneration" such as the number of tree seedlings of desirable species per acre that would be a minimum regeneration standard.

The standard for a "desirable stand for natural regeneration" of between 5 and 50 trees of desirable species per acre, depending on their size, is not a very dense stand of desirable trees and is not acceptable. However, it is considered a minimum standard by which a stand can develop, regenerate, and maintain itself as a "desirable stand for natural regeneration". Each of the trees of "desirable species" in the acre is capable of producing thousands of young seedlings under proper conditions. In fact, we could have far too much natural regeneration of "desirable species" from these few trees making it necessary to carry out a cleaning or thinning operation.

So, what we are talking about here is a minimum standard for the regeneration itself. If we get a certain minimum quantity of regeneration per acre we can cut the rest of the trees in the stand.

If regeneration of "desirable species" develops naturally, or as a result of partial cutting operations, to the tune of at least 400 per acre, then we can alter our method of harvesting if we want to. This regeneration of desirable species should be well established before counting (over one foot tall) and should be well distributed throughout the stand. They can, of course, be mixed with trees of species not considered desirable. This then is the minimum standard of regeneration or "satisfactory regeneration" that we want from "desirable stands for regeneration"

Why is "satisfactory regeneration" counted only in trees one foot high and over? Research shows that in clearcutting operations some advance regeneration of trees less than one foot in height die from the change in climate that occurs. Seedlings under one foot cannot survive the sudden increase in temperature and light as well as the seedlings over one foot.

What Kind of Management Produces "Satisfactory Regeneration"?

As mentioned earlier, partial cutting is a necessity to produce forest stand conditions that will promote natural regeneration of "desirable species". Partial cutting requires the careful selection and marking of individual trees to be cut and the close supervision of the logging operation to prevent damage to existing regeneration of trees of "desirable species".

Partial cutting can be divided into two basic methods: shelterwood cutting and selection cutting. The basic difference between the two is that in shelterwood cutting the whole stand is eventually clearcut (after regeneration is established) while the stand never gets completely clearcut in selection cutting.

Shelterwood Method. Softwood and mixedwood stands of desirable handwoods, spruce, pine respond particularly well to shelterwood cutting. Pure hardwood stands do not respond as well except when more than 25 per cent of the volume is in species such as yellow birch, sugar maple, white ash, and red oak.

Normally, there are three steps in the shelterwood method, which are completed over a period of no less than 10 years nor more than 20 years. All cuts should be timed to correspond with seed years of "desirable species".

The first cut should be light, removing not more than one third volume of the stand, including merchantable dead, dying, or windfallen trees. This type of cutting is the first or preparatory cut of a possible three-step shelterwood. Since all overstory trees are about equally resistant to windfall, the general level of the canopy should be maintained by removing trees mostly from the codominant and lower crown classes. Emphasis should be placed on cutting the less desirable species such as balsam fir, aspen, poplar, red maple, beech, and leaving the longer lived red spruce, pine, sugar maple, and yellow birch. One should leave as many trees of

desirable species as possible, and these should be well-distributed and undamaged. Trees of low quality should be removed first. Avoid creating large openings in the canopy by distributing the cut over the entire area.

In the second cut, if regeneration is still less than 400 trees per acre of "desirable species" five to 10 years after the first cut, another partial cut should be made in the stand. If adequate natural regeneration of "desirable species" is present, the stand can be clearcut. This second cut should also remove about one third but not more than one-half of the residual volume with the emphasis on less desirable species. The second cut is the seed cut in a three-step shelterwood. The largest and most vigorous dominant and codominant trees of good form, preferably of desirable species, should be reserved as the seed source. Avoid cutting openings in the canopy larger than one-half tree height, by distributing the cut over the entire area.

The third or last cut is the final harvest and should remove all of the remaining overstory. It should not be made until a manageable stand of regeneration, preferably of desirable species, has become established. This removal will result in a clearcut.

Selection Method. Stands suitable for selection cutting theoretically contain trees of all ages, ranging from seedlings to mature trees. Harvesting the few big and mature trees is like retiring the top executives from a corporation. Theoretically, middle management people move to the top and juniors replace them. Unfortunately, it doesn't usually work out this way, since not all personnel are suitable for promotions. It is very often the same with trees.

In the selection method individual mature trees are selected for harvesting, leaving very small scattered openings in the stand. Some trees may also be removed in small groups but the openings are still very small, usually less than one half acre. Cutting is carried out at relatively short intervals of five to 10 years throughout the stand. Such periodic cutting allows for continuous regeneration so that a permanent forest cover is maintained. It is important to note, however, that selection cutting can seriously degrade the forest if it is not properly carried out.

The selection cutting of individual trees is best suited for long-lived stands of tolerant species such as beech, hemlock, red spruce, and sugar maple that can reproduce and grow in considerable shade. Group selection cutting will favour some species such as yellow birch, white pine, and red spruce.

Selection cutting practices are based on: stocking, diameter, species and tree quality. Many stands contain large numbers of highly defective and poorly formed trees particularly after having been highgraded a number of times in the past. To improve these stands, one should select the poorest for cutting and leave the best ones.

Consider cutting any tree not expected to live until the next cut, as well as cull any highly defective trees that will not increase in value. Crooked or leaning trees, and those with large diameter limbs, should also be considered for cutting; so should trees that interfere with the full development of crop trees.

In softwood and mixedwood stands, the total volume measured on all trees before cutting should be reduced by no more than one third; less if the density is low. Cutting can be carried out at about five-year intervals. This will help ensure the windfirmness of the residual stand.

The desirable stocking to be left in a hardwood stand after cutting should not be less than 80 square feet per acre. Regard this as an absolute minimum.

Leave as many trees of desirable species as possible, well distributed throughout the stand, and undamaged after the cutting is completed.

Additional Treatments

Logging machinery may disturb the soil enough to create satisfactory seedbed conditions for certain species following summer or fall logging. However, if logging was carried out in winter with considerable snow and frozen ground, scarification (artificial disturbance) will probably be required. Yellow birch and white pine regenerate rather prolifically on scarified soil under half light conditions. Scarification will almost always be beneficial where these species are involved. It should be carried out after the second or seed cut of the shelterwood or after any cut of the selection method. There are many ways of disturbing the soil, but perhaps the best for small woodlot operations is by using single Bracke scarifier behind a farm tractor or small caterpillar type tractor and running it through areas that have little regeneration of "desirable species". Zig-zagging a small steel-tracked tractor through the woods is another simple method.

Partial Cutting

Light, periodical partial cuts may be more expensive to carry out than commercial clearcutting, **but they do so much more for the forest.** Modern technology has created some super machinery for harvesting forests, but they are so big and expensive that clearcutting is the only possible way they can work in order to make an operation profitable and much natural regeneration is destroyed by this system.

There are, however, good indications that a small crew working with a team of horses, or with a small logging winch on a wheeled tractor (such as the Swedish Farmi winch) can produce a very good annual revenue from about 5,000 acres of forest land perpetually. The small size of the animals or winch allow one to carry out partial cuts which practically guarantee "satisfactory regeneration" and there is no need for artificial regeneration, site preparation, or the like.

(Continued on Page 16)

Potential for Gasohol Production in Canadian Agriculture

by Louis Payette[1]
Third-year agricultural student

Gasohol is a blend of 10 per cent anhydrous ethanol and 90 per cent unleaded gasoline. It is considered a partly renewable source of energy since ethanol (ethyl alcohol) is a product derived from an agricultural commodity. In 1975 Brazil started a national program promoting gasohol production from sugar cane and manioc (cassava). In 1980 an estimated eight per cent of gasoline used in Brazil consisted of gasohol. The Brazilian government set the objective to reduce petroleum imports by 20 per cent in the coming years. In the United States last year, President Carter announced a national program promoting ethanol production primarily from grain corn. One year after, Americans can buy gasohol at about 2,000 gas stations. Gasohol has also received attention in Canada as a means of conserving our valuable, but depleting, oil resource. This article examines the potential for gasohol production in Canada and some of the problems involved.

Gasohol is not a new source of energy. Henry Ford built his first model of a car working with either gasoline or 100 per cent pure alcohol or a mixture of both by applying an adjustable carburator. During the depression, in the 1930s, many Americans, mostly in the Corn Belt, were filling their cars with gasohol without modifying their engine designs. Before World War II, the mixture of gasoline and ethanol was well known around the world. During the war, however, alcohol was needed to make synthetic rubber. Following the war, many distilleries were shut down as fuel prices were rather low. But in 1957, in France during the first petroleum crisis, people started to use gasohol.

Technical Considerations

All sorts of raw material could be used for ethanol production, but only a few are economically feasible. Crops containing high levels of sugar and starch are preferred since they can be efficiently converted to ethanol. Sugar crops are readily fermented and distilled to yield ethanol while starch crops require hydrolysis before fermentation. Basically, the starch is broken down by enzymes, like barley malt, to produce sugar that can be converted by yeasts to alcohol and carbon dioxide. This product is then distilled and yields ethanol dioxide and a protein-rich stillage.

Table I reveals both the crop and alcohol yields of selected commodities considered for gasohol production in Brazil and the United States. Brazilians utilize sugar cane because it is a high-yield, high sugar content crop. Moreover, the fibrous stalk residues can be used as an energy source for the distillery, making the plant more energy self-sufficient. In the United States grain corn is used. It is starchy (61 per cent starch), high yielding, and easy to handle. The production of ethanol from grain corn leaves behind a protein-rich stillage containing 26-32 per cent protein on a dry matter basis. This stillage has proved to be a good nutritive source of animal feed and can be fed directly to livestock. In this form, the stillage is a wet product and has a usable life of no more than 48 hours. Drying the sillage increases the energy investment approximately 25 per cent over the process that uses it in the wet form. Dried stillage or distillers dried grains (DDG), however, can be stored and transported as feed with practically no loss in nutritional and commercial value.

Alcohol yields for selected crops in Canada are presented in Table II. Sugar beet, potato, corn, and Jerusalem artichoke are most efficient in terms of alcohol yield per acre. In contrast, spring wheat (and other grains such as rye, barley, and oats) provides a very small amount of alcohol on a per acre basis due primarily to a low starch content.

Production Cost

The largest portion of the total cost of ethanol production is the value of the grain itself. This year, the selling price of corn on the world market is U.S. $3.74/bushel. Since one bushel of corn yields 2.6 gallons of ethanol, the grain cost amounts to $1.44/gallon of ethanol, which is not a competitive price with gasoline for the moment. Apart from production costs, the concept of energy balance should also be considered. This refers to the relation between energy input and energy output in the production of gasohol. The energy balance is a functional relationship of the material used for heating, the base material for ethanol, and the technology applied. In view of the lack of concensus regarding the energy balance for ethanol production, this is an area that requires further investigation.

Potato and Jerusalem artichoke utilization presents a situation differing from corn. Before reaching the consumer, up to 20 per cent of the potato crop is culled because it doesn't meet specific grading standards. The culls could be fed to livestock, but the potential is limited. Consequently, potato culls have practically no market value. Jerusalem artichokes have also considerable potential for ethanol production. The tubers of Jerusalem artichoke grow in the ground, like potatoes, even on poor sandy soils. The reason they are not cultivated extensively in Quebec is because there is at present no market for them. Ethanol production could pro-

[1]The author is indebted to Professors L. Fischer and J. Angus for advice and criticism in preparing this report.

vide an excellent market for Jerusalem artichoke where it is not economical to grow other crops on poor soils.

The Canadian Situation

The United States is the world's largest producer of grain corn. For American farmers ethanol production represents a way to utilize their surplus corn. Furthermore, the production of ethanol reduces foreign oil imports. In Canada, however, the situation is different. The production of gasohol in western Canada is unlikely to expand in view of the favourable oil supply and price situation. In central Canada, Ontario farmers grow a quantity of grain corn that could support an ethanol industry, but most of the crop is needed in the livestock industry leaving almost no opening for the production of ethanol. In Quebec corn production is limited, yet potatoes and Jerusalem artichokes may present some potential for gasohol production. The Maritimes are particularly affected by the high energy cost and that makes the search for alternative energy sources more interesting. In summary, there would appear to be considerable potential for producing ethanol from culled potatoes in P.E.I., N.B., and Quebec. There is also potential for Jerusalem artichokes where there is a comparative advantage in growing them on poor sandy soils. There is, however, a host of technical and economic problems to be resolved to make gasohol production attractive for the farmer and the manufacturing industry in eastern Canada. Supported by a federal grant the Department of Agricultural Economics of Macdonald College has established a research project on the feasibility of gasohol production in Canadian agriculture.

TABLE I. Alcohol yield of selected crops, U.S. and Brazil.

	1977		
		Alcohol Yield	
Crop	Crop Yield Per Ha (metric tons)	Per Ha (litres)	Per Acre (gallons)
Sugar cane (Brazil)	54.2	3,360	388
Sweet Sorghum (U.S.)	46.5	3,554	381
Corn (U.S.)	5.7	2,200	235
Cassava (Brazil)	11.9	2,137	228
Grain Sorghum (U.S.)	3.5	1,362	146
Wheat (U.S.)	2.1	773	83

Source: Food and Agriculture Organization; U.S. Department of Energy; Office of Technology Assessment; U.S. Department of Agriculture, cited in **Food or Fuel: New Competition for the World's Cropland** by Lester R. Brown, Worldwatch Paper 35, Washington, D.C., March 1980, p. 8.

TABLE II. Alcohol yields from selected crops in Canada.

Crop	Alcohol Yield Per Acre (imperial gallons)
Sugar beet	274
Potato	206
Corn	196
Jerusalem artichoke	150
Spring Wheat	61

Source: **Ethanol from Renewable Resources and its Application in Automotive Fuels — a feasibility study,** D. S. Clark, D. B. Fowler, R. B. Whyte, and J. K. Kiens, report by the office of the Minister responsible for the Canadian Wheat Board, January 1971, pages 41 to 43, and page 66.

Bibliography

1. Albright, Darold. *Gasohol Production: current status and future role.* International Biomass Institute, in *Biogas and Alcohol Fuels Production, The Staff of Compost/Science/Land Utilization, the JG Press, Emmaus, January 1980, pp. 83-88.*
2. Beierlein, James G., *Sense and nonsense about gasohol,* Farm Economics, the Pennsylvania State University and the U.S. Department of Agriculture Cooperating, December 1979, 4 pp.
3. Brown, Lester G., *Food or Fuel: New Competition for the World's Cropland,* in *Worldwatch Paper 35,* Worldwatch Institute, Washington, D.C., U.S.A., March 1980, 43 pages.
4. Engineering and Statistical Research Institute. *Alcohol Fuels from Agriculture,* Research Branch, Agriculture Canada, Ottawa, January 1980, report no 1-165, 85 pp.
5. Fischer, Lewis Dr., *The Gasohol Question,* Economics Department of Macdonald College, McGill University, Quebec, 1980, 15 pp.
6. Golueke, Clarence G., *Principles of Alcohol Production from Wastes* in *Biogas* and Alcohol Fuels Production, The Staff of Compost/Science/Land Utilization, the JG Press, Emmaus, January 1980, pp. 43-50.
7. Heady, Earl O., *Roots of the Farm Problem,* Iowa State University Press, 1965, 224 pp.
8. Kendrick, J. G. and P. J. Murray (1978). *Grain Alcohol in Motor Fuels: An Evaluation, Agricultural Experiment Station, University of Nebraska, report 81, cited in Alcohol as a Fuel: Energy and Economics,* Agricultural Engineering Department, Michigan State University, 1978, 5 pp.
9. Peters, Celeste, *Power Alcohol Faces Staggering Problems* in *Country Guide Farm Magazine,* Public Press of United Grain Growers Limited, Winnipeg, August 1980, pp. 34-36.
10. Stelson, T. E., *Fuel from Farms — a guide to small-scale ethanol production, U.S. Department of Energy, Tennessee, February 1980, 152 pp.*
11. *Tyner, W. E. and M. R. Okos (1978). Alcohol Production from Agricultural Products: Facts and Issues,* CES Paper, 29, Purdue University, Lafayette, Indiana, cited in *Alcohol as a Fuel: Energy and Economics,* Agricultural Engineering Department, Michigan State University, 1978, 5 pp.
12. U.S. Natick Research and Development Command, *Producing Ethanol from Cellulosic Biomass,* Massachusetts, 1979, 20 pp.

The Family Farm

Published in the interests of the farmers of the province by the Quebec Department of Agriculture.

SEVENTY-EIGHT PER CENT OF FATAL ACCIDENTS ARE DUE TO TRACTORS

Accidents on farms during the seeding period remain quite numerous. Only by being careful and using safety measures can the numbers be reduced.

After a long period of winter rest, farmers start in again on the land and are busy from seeding through to harvest. In the spring they are generally too rushed and too active and, unfortunately, they forget the saying of Mr. Lafontaine, "There is no point in running; one has to start on time." In fact, it is during the seeding period that the accidents are most numerous.

According to the Canadian Security Council, the rate of accidental deaths on farms over a period of one year exceeds the national average by 20 per cent. In spite of the constant decrease in the number of farmers as compared to the total population, the rate of accidents which occur on the farm remains higher than the average.

This unfortunate situation may be explained, partly, by the greater use of more powerful and complicated machinery on farms. But the main cause of most of the accidents which occur on farms is due to the farmers' haste. They are caught in a time squeeze trying to accomplish tasks and thus forget the most elementary rules of prudence and safety by acting in an unthinking manner. The whole thing is due to a fraction of a second of negligence, thoughtlessness, unconcern, carelessness, and lack of constraint.

In the southwest region of Montreal, which is commonly known as agricultural district No. 7, during one year about 15 people lose their lives accidentally on farms. About 250 are seriously hurt and 15 remain crippled for life. In the 12 agricultural districts of Quebec, without exaggerating, one can multiply these figures by 10, and for Canada by 100.

Surveys have proven that for every 100,000 farmers, deaths due to machinery have doubled during the last 10 years. Of all the fatal accidents due to machinery, 78 per cent are due to tractors and more than half of this number are due to overturning of tractors. The machinery most often implicated in accidents, apart from tractors, are combines, hay presses, corn harvesters, and spreaders.

The victims are most often snatched by the machines or crushed. Many farmers neglect to leave the protective devices in place or they carry on repairs while the motor is running. Some fall off the machine as it is running.

In order for an agricultural enterprise to succeed, it is necessary that the different operations that are required be carried out in a regular rhythm and according to an overall plan. An accident, which happens so fast, — it's a matter of a fraction of a second — can ruin the best conceived plan, can exhaust the financial reserves, and, in many cases, can deprive the agricultural producer of his livelihood and can force him to abandon the farm and agriculture. To protect himself this year against these losses, which are as costly as they are paralyzing, every farmer should be conscious of his responsibility toward his family and himself, and must include in his plans efficient measures to prevent accidents. He must convince his employees and the members of his family to take necessary precautions when they carry on their daily tasks and not to forget to carry insurance against all hazards and accidents.

Here are a few general words of advice given by Mr. Gabriel Gabreau, Agronome, to avoid accidents on the farm; their use may save many lives and avoid many troubles.

— Lift and handle heavy objects in such a way as not to tire yourself, hurt your back, or get a hernia. Bend the knees and not the back.

— Protect your hands — wear leather gloves.

— Protect your eyes against dust and straw — wear protective glasses.

— Protect your feet — wear safety boots or shoes.

— Protect your head — wear a safety hat when there is danger of bumping your head or of being hit by a falling object, or of falling or sliding.

— Wear coveralls or a dust coat when you work in dense dust or in straw.

— Protect your skin and head against the burning sun and do not work too long if you are enclosed in a hot area.

— Make sure not to be caught at nightfall on the road without the necessary safety lights.

— Stop work periodically in order to refresh yourself. This relaxation will conserve your energy and will decrease tiredness, a cause of accidents.

— When you are working with machinery be constantly on your toes.

— Observe the safety advice which is written on the equipment.

— Only the driver should come close to any mechanical machinery.

— When you are buying material, think seriously of the safety devices.

— Read the instruction manuals and become familiar with them.

— Prepare your daily work with security in mind: get sufficient rest, wear the appropriate clothing, and work at a speed in relation to your physical capacity, and do not use machinery if you are sick, taking medication, or if you are upset.

— Wear comfortable and well adjusted clothes which do not have hanging parts which could be caught in dangerous machinery and which will protect you against burning sun, humidity, or cold.

— In hot weather drink a lot of water and take salt to compensate for losses which occur when perspiring.

— When you are transporting agricultural material or products on public roads, obey the traffic regulations. Before entering a road, stop and verify if there is traffic or not. Signal clearly and long enough ahead of time your intentions before going onto the road or onto a field. Obey the provincial regulations concerning agricultural equipment on public roads and use the emblem for slow-moving vehicles.

— Avoid rushing or running which cause many accidents. Follow the manufacturer's recommendations in using tractors and farm machinery. For transportation or towing, use the speed which is in relation to atmospheric and other conditions.

— Remember that security on the farm is synonymous with carefulness.

WEIGHING LAMB: WHY, WHEN, AND HOW

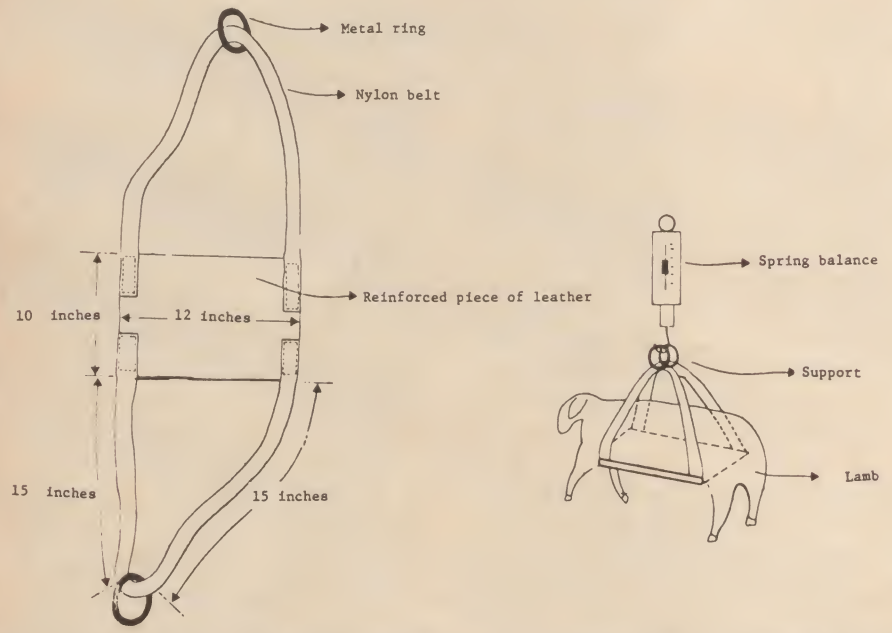
The sheep producer who wishes to carry out a good selection in his flock must be able to identify with certainty the most productive ewes. Since productivity in sheep raising is indicated by the weight of weaned lamb per ewe per year, it is important for the producer to weigh the lambs at weaning time.

Indeed, according to Mr. Pierre Demers, Agronome, the prolificacy alone cannot be the only selection criterion: in addition, the lamb must have reached an acceptable weight when weaning time comes. The weight of lambs at 50 days of age indicates very well the aptitude of the mother to produce milk, the almost exclusive source of nutrients for the young from birth until weaning time. This indirect milk production monitoring is therefore indispensable for the producer who wants first of all to keep his best ewes for breeding.

To weight the lambs, the producer may use a spring balance that can be found at farm equipment dealers for about $25. We are suggesting here a model of a support which facilitates this rather difficult and arduous task which weighing lambs is (Figure 1). It is made of nylon belts which resemble car safety belts, and the bottom is made from a piece of leather or vinyl reinforced by a piece of plywood. We had ours made by the local shoemaker for only a few dollars.

In this management program, the producer should therefore devote a few minutes or a few hours to weight the lambs at the opportune time. It is not necessary to weigh each animal as soon as it reaches the age of 50 days: on the contrary, in order to benefit from the services of the federal-provincial program on Record of Performance of sheep, all the lambs born during a given month (for example, January) must be weighed on the same day (for example, at the beginning of March for the weighing at weaning time of lambs born in January), otherwise the data will be rejected by the computer.

A SUPPORT TO FACILITATE THE WEIGHING OF LAMBS



Once the weighing has been done, the producer who participates in this Record of Performance program completes the barn sheet and sends it to the Bureau des renseignements agricoles (the Office of Agricultural Information). He will receive, later on, the weight at weaning time of his lambs adjusted in order to put all the subjects on a uniform footing.

In order to easily evaluate the performance of the animals one has only to read the column "ewe-index" which indicates the productivity of each of the ewes in comparison to the group average.

If the producer wishes to know more on the value of his lambs specifically, he carries out a second weighing at about 100 days old in order to evaluate the post-weaning growth. Again, the lambs are all weighed at the same time, that is, in mid April for the lambs born in January. The post-weaning rate of growth of the lamb being a highly inherited characteristic, the selection based on that criterion gives positive results quite rapidly.

The Record of Performance program supplies results of the weighing at 100 days old with all the necessary adjustments to equitably compare the lambs and, therefore, permits the producer to carry out a logical selection of males and females for reproduction.

You are therefore encouraged to take the trouble of weighing your lambs at weaning time and at 100 days. Consider the time and effort that you are putting into it today as an investment which will bring returns in the next generation of replacement ewes.

(Continued from Page 11)

The previous partical cutting silvicultural systems concern themselves directly with regeneration. They are not cut-and-get-out systems. They are systems that allow the forest to regenerate naturally over a period of time as the older trees in the stand are gradually removed. We know of no better way to obtain satisfactory natural regeneration of desirable species. It would seem that subsidies should also exist to encourage partial cutting and natural renegeration and to avoid the violation of forestry which clearcutting without concern for the future crop represents.

Big may be beautiful to some people but there is no question that where good forestry practice is concerned "small is better".

This Month with the QWI

Photos taken at the 70th Anniversary of the Dunham WI. Above left, Mrs. Ella Brown and Mrs. Barbara Harvey, President. Mrs. Brown is the daughter of Mrs. Beech, the organizer of the first WI in Quebec in Dunham on January 27, 1911. Above right: Branch Conveners, front, Mrs. Myrtle Selby, Mrs. Elda Martin, Mrs. Dorothy Paterson, Mrs. M. E. Perkins . Back, Mrs. Dorothy Clark and Mrs. Ruby Sherrer. Below right, Dunham Executive, front, Jane Greig, Pearl Yates, Barbara Harvey, Marjorie Martin, and, back row, Mrs. Lou Staton.

News from provincial office

The EXPO QUEBEC tags and labels have arrived and have been forwarded to County Conveners who are waiting to give you all the information needed to submit your entries to EXPO QUEBEC. We are hoping that all members who entered a sleeveless vest, a rag doll, or a lady's nightdress in the QWI Competition will submit their entries to EXPO QUEBEC. Let us be represented at Quebec this year like never before.

Small wonder that James Herriot writes so fondly of the people of Yorkshire. Miss Clarke and I were delighted and charmed with a visit from Marjorie Jones from Harrowgate, Yorkshire. Mrs. Jones has been visiting her niece Mrs. Pamela Taylor in Rosemere for the past month. Mrs. Taylor was most anxious that her aunt visit as much of the countryside as possible. One such visit was made to the home of Mrs. H. Scott in Dewittville. Mrs. Scott along with some WI members in her branch graciously entertained Mrs. Jones one afternoon, which Mrs. Jones truly enjoyed. She said she found the Canadian people so hospitable and so friendly.

Mrs. Jones, her niece, Miss Clarke, and I spent a precious hour or so together over lunch at Tadja Hall here at Macdonald. We wished that there was more time to visit with Mrs. Jones; however, she is a busy WI member back in England and has patients waiting for her. Mrs. Jones is a chiropodist with a full time practice at the age of 80. We were sorry indeed to bid her adieu.

Sheila Washer
QWI Provincial Secretary

Active Members

Five **Marcil** members gave testimony recently at public hearings in New Carisle when the Railway Transport Committee of the Canadian Transport Commission

considered arguments for and against the Campbellton and Gaspe Servocentres application submitted by the CNR. At issue were the closing of agency positions, the removal of caretaker positions, and of station buildings at many points in the Gaspe.

This time in New Richmond three members attended a workshop session of the Gaspe Literary Council. This is a volunteer group who are interested in teaching adults to read. This is a very interesting experience for the new teachers in this worth while project. Mrs. Thelma Blinn, of Halifax, conducted the workshop.

The branch has taken a membership in Diffision Communautaire Baie-des-Chaleurs, Inc., and have appointed two members to be the representatives. This organization aims to bring English news, via local radio, to the area.

On the lighter side, at our April 1st meeting, our Secretary presented each of us with a slip of paper on which to record our wishes concerning WI doings. Some of the questions seemed rather odd, but we all pondered them carefully only to be told to fold our papers and discard them. It was April Fool!

We are happy to report that we welcomed a new member at the May meeting.

May Fair

For the past few years the **Hatley** WI ladies have held a May Fair. This branch may be small in number but they are large in talent and activities. This year the fair was held on May 16 in the village town hall where all visitors were warmly welcomed. There were tables covered with many crafts, house and garden plants, shrubs and bulbs, home-baked foods and second-hand books. All were for sale.

A raffle of a painting and two lovely knitted cushions was in charge of Mrs. Mona Sherman who, just prior to the fair, had observed her 80th birthday. Mrs. Madelene McClary gave a demonstration of etching on aluminum that looks like a fascinating hobby and another lady served tea and from the tea leaves read the fortunes of those who "crossed her palm with silver."

On display were hand crocheted table covers, a latch drawn rug, a buttterfly appliqued quilt, and other items that were a joy to view. Another group of members sold sandwiches, doughnuts, cookies, and beverages.

It was an enjoyable day for the WI group as they greeted and chatted with all who came and a rewarding day for visitors who had enjoyed the fellowship and hospitality.

Mrs. Ivy Hatch,
Stanstead Publicity Convener.

FWIC Cultural Project

A profile on three artists from Quebec:
a) a painter;
b) a writer;
c) a musician.

Each artist should be either native to Quebec or one who has resided here and plans to reside here in the future — one who truly represents Quebec. He or she may be a person you would like to make known or who is already famous.

These profiles should be typed, if possible, on pages approximately 8-1/2 by 11, on one side of the page only.

Please send your entry or entries by August 15 to:
Mrs. Joyce Gilchrist,
R.R. 2,
Melbourne, Que.
JOB 2B0.

Don't forget to mention your Branch and County!

Spring Fling for Shipton

Instead of the usual fall fair at school, it was decided to hold a spring fair called the "Spring Fling." It was held during the March break and the decor was St. Patrick's throughout.

It was a two-day affair with the first day spent placing the exhibits, crafts, artwork, kites, mobiles, and every conceivable thing that could be produced by hand and with imagination. The classes, too, had their class projects: the history of Danville and Indian villages.

The second day was open for all with lunches and refreshments, candy sales, and so on. It was an exciting atmosphere. In the afternoon, following a play by the young Indians and a trampolene display, came the prize-giving with cash prizes, medals, and the WI Trophy which was won by Tina Pezzi. Fourteen judges had the task of deciding the winners and the school staff and WI members worked very hard.

It was a decided success. A "Spring Fling" was had by all!

A Year's Activities

Apart from the regular WI meeting, **West Island** members meet every third Tuesday of the month for a handicraft meeting. We meet at the Dixie Chalet which is made available by the city of Lachine. The city also provides a certain amount of free photocoping service each year for which the branch is extremely grateful. Most supplies for group handicraft projects are donated by the members and are sold at the annual bazaar. Many of the items are started at home by individual members and then taken to the meetings where finishings touches are added as well as to show other interested members how they were made. This year we learned to make "frustration" pencils and little angels to hang on Christmas trees. We could have used the frustration pencils when trying to put the "hair" on the angels.

The senior citizens in Lachine have a drop-in centre "The Teapot" and were in need of clockroom checking tags. Because they are expensive to buy, we decided to make them. We used two cardboard tags with a metal rim and string attached, along with two clothespins. This allowed one tag for the coat hanger and one for the person, a clothespin for boots and one for a hat. An enjoyable time was had at one of our

handicraft meetings numbering the pins and tags and adding a coat of shelac. Two of our members volunteered to help at the seniors' Christmas party and reported that the tags were well worth the effort. Not only did they cost less than half the price if purchased, the pegs worked better than tags for hats and boots.

West Island sponsors a child through CanSave and the members try each month to send a postcard with a picture of Montreal or Canada on it. They explain what the postcard is featuring and feel that this is a small contribution to the child's education. Money was given to a needy family at Christmas as well as to the Gazette Christmas Fund and to the Douglas Hospital.

Roll call for a special meeting was bring a tin of food for the Women's Shelter, when we had as guest speaker Mrs. Ruth Spreekmeester, Director of the West Island Women's Shelter. She explained that the shelter is a place where battered wives can go for help. They are referred or brought to the shelter by the police or a hospital and can stay for a few days until they are able to decide what to do with their future. Legal aid is available along with support from people who have gone through similar problems. The women may bring their children with them. As they often arrive during the evening or late at night, the volunteers are kept busy helping to put the children to bed and sitting and chatting with the women over coffee. West Island has donated a vacuum cleaner to the shelter and helped for a few months with their phone bills.

Dear WI Members:

One of the more encouraging notes in the reports was the branches that told of welcoming new members: **Arundel, Dalesville-Louisa, Brownsburg, Jerusalem-Bethany, Marcil, Spooner Pond, Richmond Hill, and Aubrey-Riverfield.**

There was a fair amount of branch interchange with **Pioneer** receiving an invitation to **Frontier's** tea and sale. **Dalesville-Louisa** catered a delicious luncheon for **Brownsburg**'s annual meeting. **Dennison Mills** was catering for the County annual and evidently they specialize in the most delicious salads this side of heaven. They may be few in number but they work twice as hard as the rest of us and, the report continues, this kind of spirit is what keeps the WI alive. **Ascot** sent an invitation to **Melbourne Ridge** which was graciously accepted. **New Richmond West** hosted the County annual with 51 members in attendance. An exceptionally large exhibit of handicrafts and baking kept the judges busy. Exhibits called for at the County level were 1) single loaf of white bread; 2) six gingersnaps; 3) two pot holders; 4) adult's sleeveless vest, and 5) any embroidered article. At the afternoon session, the tape of Father Larry's speech was listened to with interest. Last but not least, **Brompton Road** entertained the **East Angus** members and **Lennoxville** welcomed members from **Sawyerville.**

Several In Memoriams to the Adelaide Hoodless Home were mentioned: **Aylmer** for Mrs. Beryl Radmore, the branch treasurer at the time of her passing; **Fordyce** for two pioneer members, Mrs. H. Kemp who was first president in 1921 and Mrs. E. C. Knight, who was Secretary for 21 years as well as holding many other offices, including County President, and **Stanbridge East** sent a donation in memory of Mrs. H. Harvey. **Cowansville** sent an In Memoriam to the Brome Missisquoi Hospital and the Eastern Star Memorial Fund. At **Grenville** Mrs. Louise Murray told members that the branch had received a very generous donation of $500 by Mrs. Lynda Newson of Saskatchewan in memory of her mother Mrs. Doris Silverson. **Aylmer's,** Hilda Graham sold her 70th Anniversary Song Book and read a brief history of her life as an Institute member. To quote from the Publicity Convener, "She sure makes an interesting meeting."

Branch Conveners had interesting contributions to meetings:

Sutton's Welfare and Health Convener Mrs. Eva LaRoche gave a demonstration on doll making. She had a step by step layout of the process in how to make a yarn doll. After having the major points explained to them, the members settled down to make their own dolls. The Citizenship Convener Mrs. Cleland requested and received a copy of the BNA Act and she began a study of the Act by first giving its history. Education Convener Mrs. L. Owen gave tea at her home for a WI visitor from Ireland, Mrs. Nancy Cooke. **Brownsburg's** Citizenship Convener Mrs. J. Hartman and **Frontier's** Convener showed samples of the new set of four stamps honouring Canadians who pioneered women's entry into public life.

Agatha Ralph, Welfare and Health Convener, **Arundel,** read an article on "Goofing Off." Everyone needs some free time. One must know when to take a break in order to relieve tensions. Everyone must find time for relaxation, as efficiency improves after a break. Goofing off is not irresponsible. The Home Economics Convener, Beulah Williams, read an article on fish farms which stated that more and more of the rainbow trout that we eat in restaurants comes from these farms and have spent no part of their lives in natural rivers, lakes, or brooks. About 70,000 of these fish are sold annually to restaurants and it is predicted that as our rivers and lakes become more polluted, that number will increase.

Cowansville's Agriculture Convener Mrs. Tibbitts read an article on coppercliff the old Creighton Mine now being used as a vegetable garden. Going down 5,600 feet, tomatoes, cucumbers, radishes, lettuce are grown at 80 degrees temperature, with automatic stadium lights providing a 14-hour daytime period.

Some fun ways to collect Pennies for Friendship at **Fordyce**'s was one cent for every two inches of height and, at another meeting, five cents for every radio or television in your house. Auctions, contests, bingo, sales, and demonstrations were also reported. **Frontier** held an auction of plants, slips, and "what have you" which extended the treasury.

Lakefield, Mrs. Bourne gave an interesting demonstration and talk about making quilts and lap quilting and Connie Vipond showed how she will be putting the branch afghan together — members completed 39 squares. **Upper Lachute East End** held an auction sale with Mrs. L. Hume as auctioneer. Argenteuil County WI give each branch a small sum of money to be used for seniors in the area. Upper Lachute will raise money to augment this sum. **Dalesville-Louisa** visited the home of Nicole R. Cayer who showed them some beautiful work — lamps, lamp shades, planters, mirrors, dired flowers mounted in glass frames, and placed in pendants. **Cleveland** had an auction with Sandra Parriseau acting as auctioneer. They also had a quiz with Doris Taylor in charge. Name parts of the body beginning with the letters of the first name of everyone at the meeting. This proved to be quite hilarious with Peggy Healy and Sandra Parriseau the winners. **Dennison Mills** had a successful baking bingo at the home competition. **Dennison Mills** had a successful baking bingo at the home of Mrs. Margaret Stalker. All the prizes were home baking. **Spooner Pond**'s sales table produced a nice sum for the branch. A contest on what do you know about sleep was won by Mrs. D. Goodfellow. The sale of paperback books has enabled the branch to purchase a book to be presented to Richmond Regional School. Several scrumptions ways of using maple syrup were given by members who also made plans for competitions in family gardens and involvement in a Farmer's Market later in the fall. A sale at **Richmond Hill** brought in money that will be used for school prizes for grades 1 - 6 for most improvement in spelling. Two crazy quilts were sold and a garage sale is planned and a sale of remnants was held. **Melbourne Ridge** members brought in their oldest possessions and told something about them. This was so popular it will be repeated. A white elephant sale was a huge success and a booth was agreed to for the Farmer's Market. At **Stanbridge East** a contest was held by Mrs. Stote, Agriculture Convener, on vegetables. A description was given and members wrote down what vegetable they thought it was. **Hemmingford** and **Franklin Centre** reported on successful card parties. **Lennoxville** is setting up a program for the collection of paper and glass for recycling, which, they hope, will continue each month. **Dewittville** had a "Who was Who" baby picture contest. The best score was 8 out of 29 and the prize was a bottle of local 1981 syrup.

Mrs. R. Short joined **Stanbridge East** in 1970 and has never missed a meeting, while at **Richmond Young Women,** seven cups and saucers were given to members with perfect attendance for the past year. This is an active branch that does a great deal of catering. They take many trips and tours and recently enjoyed a Chinese "Eat-Out". Seven members at **Kinnear's Mills** received cups and saucers for perfect attendance. **South Bolton** had a bigger and better than usual Christmas meeting. They were pleased to have Mrs. Ola Carr, County President, and Mrs. Lillian Miltimore, County Vice President, as well as other guests from Glen Mountain, Bolton Centre, Nova Scotia, etc. These guests helped to increase the size of the annual gift to the Christian Blind Mission but more than that they helped the regular members to enjoy the fun and spirit of Christmas, **Austin** entertained 54 members and senior citizens at a hot dish dinner. Bingo was played after dinner with each player winning at least one gift.

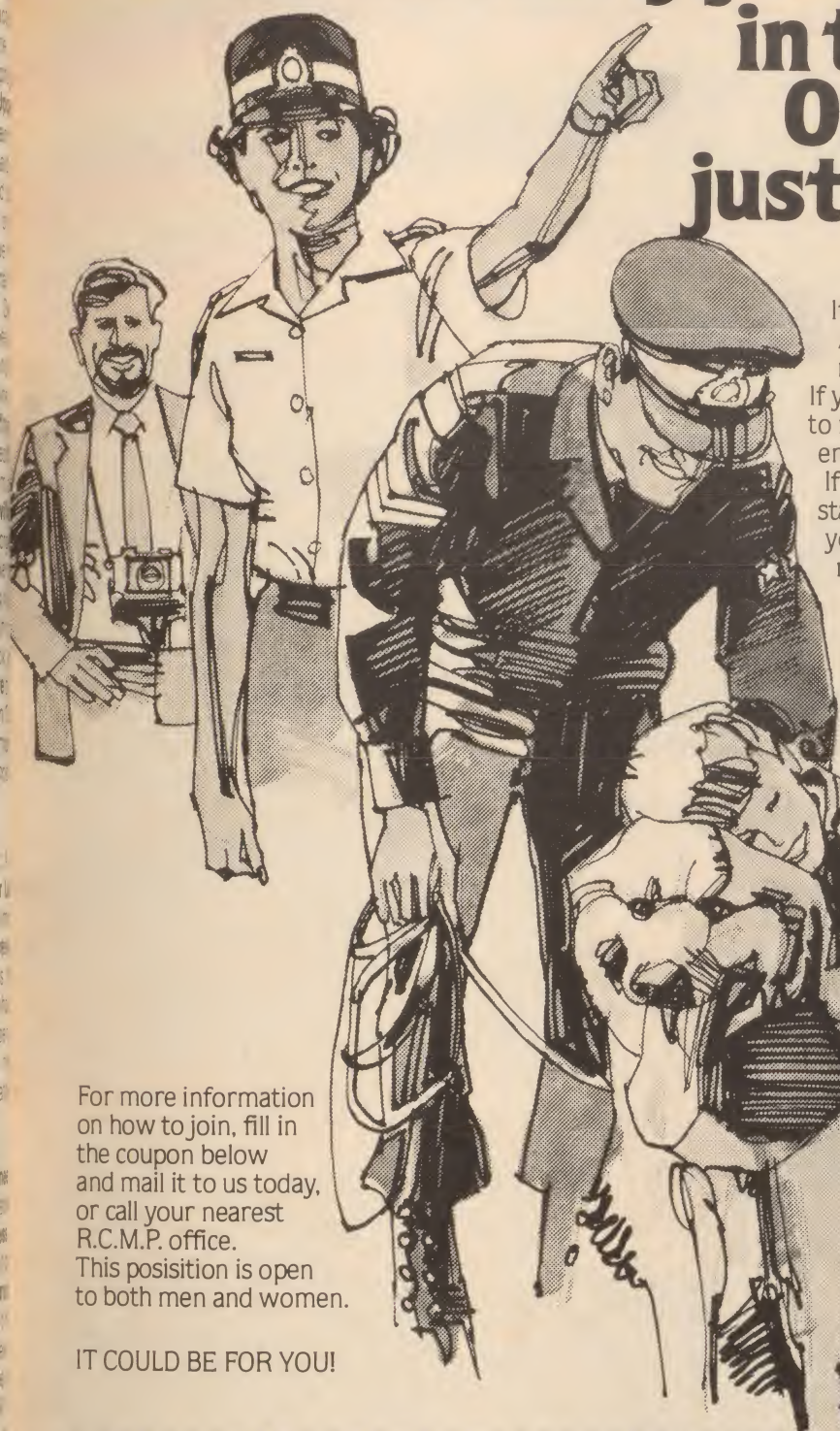
Subjects of guest speakers were interesting and varied. Mrs. Ronald Rothney, Ascot branch, spoke to the **Belvidere** members on the handicapped and disabled. She mentioned that Quebec is the only province that has legislated civil rights for the mentally retarded. Her talk was followed by a discussion. At another meeting, Mrs. Warren Ross of the Lennoxville WI, told the members of the farming conditions in New Zealand where she and her husband had been on a tour. Mr. Gerald Frost from the Lennoxville Community Aid spoke at **Ascot.** He discussed the aims and needs of this new venture which is to include all citizens within a 10-mile radius of the town. Claudia Bowers was the guest speaker at **Gore** and she gave an inspiring talk comparing community life in her early days in this locality and the important role the Institute can play in the community. At **Pioneer,** Susan Hammond and Karen Godin told of the activities of their local 4-H Club. The Club has a well rounded program of work and recreation **Upper Lachute East End** also learned about 4-H with Ross Oswald as guest speaker. He pointed out how many of the members go on to be good farmers and continue their training in other agricultural fields. **Frontier**'s guest speaker, Debbie Titley, showed lovely pieces of needlepoint, cross stich and crewel work and told how each one was worked and prepared for framing. She provided a very interesting evening and proceeds from a sale went to the branch. **Grenville** had three gentlemen: Denis Forgette, Jean Decaire, and Alain Bergeron, who showed the members how to give CPR. It can be used in cases of heart failure, electric shock, and drowning. **Franklin Centre**'s speaker was a notary from Ormstown who spoke on wills, marriage contracts, partnership, property rights, and so on.

Some interesting roll calls: A fun and noisy one from **Upper Lachute East End,** 24 members mimicked an animal on the farm; **Grenville's** was to guess the proceeds from the blind auction of white elephant goods brought in by members. The auction was held after the meeting and made $19.28. Jean Rathwell was closest at $19.25.

Some special mottos: **Pioneer,** "Forbidden fruit is responsible for many a bad jam"; **Inverness,** "Gossip is like a balloon. It grows bigger with every puff"; **Arundel,** "the only people who don't make mistakes are those who never do anything"; **Howick,** "Some special remembrance about the WI", **Hemmingford,** "A hint to spruce up the house for spring"; **Dewittville,** "Show and tell handiwork members were working on", **Fordyce,** "Instead of finding fault, find a remedy"; **Belvidere,"** "Life is like a ladder, you can go up or down", and from **Dunham,** "Don't be just a member. Be a good member."

Ruth von Brentani
QWI Publicity.

There are many job opportunities in the RCMP. One could be just right for you.



It's out there waiting for you.
A chance to prove yourself in a way you might never have thought . In law enforcement.
If you're someone who's ambitious enough to realize your full potential in a really challenging environment, this could be the job for you.
If you meet the following requirements, and a starting salary of $18,430.00 is attractive to you, you could be on the path of an extremely rewarding and satisfying future:

—a Canadian citizen
—a high school graduate or equivalent
—in possession of a valid driver's license
—of good character and good health
—proficient in either English or French
—candidates must be 18 years of age or over.

Once essential entrance qualifications have been satisfied, engagement prospects and career opportunities are enhanced by knowledge of a second official language.
If accepted, you will receive intensive training in all aspects of police work: law, investigations, first aid and community relations, for example. This is an excellent opportunity to work in an interesting and challenging field.

For more information on how to join, fill in the coupon below and mail it to us today, or call your nearest R.C.M.P. office.
This posisition is open to both men and women.

IT COULD BE FOR YOU!

Canada

RCMP GRC

The Commissioner
Royal Canadian Mounted Police
Ottawa, Ontario K1A 0R2
ATTN: Officer i/c Recruiting

NAME: .....

STREET: .....

CITY: ..... PROVINCE: .....

POSTAL CODE: ..... TEL. NO.: .....

F

MACDONALD JOURNAL

$3.00 for 1 year

$5.00 for 2 years

$7.00 for 3 years

Outside Canada - -

$7.00 for 2 years

MACDONALD JOURNAL,
Box 284,
Extension Department,
Macdonald College, P. Quebec, H9X 1C0

Please enter my subscription for ..... years at a cost of .....

Name .....

Address .....

.....

.....